DOCUMENT RESUME

ED 214 129 CS 006 547

AUTHOR Omanson, Richard C.; And Others
TITLE Modeling the Effects of Reading Lessons on Text Processing.
PUB DATE Mar 82
NOTE 33p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, March 19-23, 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Advance Organizers; Classroom Techniques; Comparative Analysis; *Directed Reading Activity; Grade 3; *Models; Primary Education; *Reading Comprehension; *Reading Instruction; *Reading Processes; *Reading Research; Teaching Methods
IDENTIFIERS *Prose Learning; Reading Strategies

ABSTRACT

A study evaluated the effectiveness of various models constructed to account for how children read and comprehended a story presented in a directed reading lesson. A commercial directed reading lesson was revised to introduce information related to the story and to help the children form a "map" of the central story content. Data were collected from 48 third grade students, who were matched for reading performance and placed in one of two groups that participated in either the commercial lesson or its revised counterpart. A description of the way in which the components of the commercial and the revised lessons influenced story processing was provided through modeling techniques. The models, which assumed that different aspects of the lessons were utilized during reading, were fit to the children's recall of the lesson story. Through comparison of the fit of these models it was found that (1) the revised lesson exerted a greater influence on processing than did the commercial lesson; (2) the points at which the revised lesson made direct contact with the story exerted a greater influence on processing than did the points at which only indirect contact was made; and (3) the questions following each segment of the story and the preparation before the story of the revised lesson exerted greater influence on processing than did other lesson components. (RL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED214129

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Modeling the Effects of Reading Lessons on Text Processing

Richard C. Omanson
Isabel L. Beck
James F. Voss
and
Margaret G. McKeown

University of Pittsburgh
Pittsburgh, Pennsylvania 15260
(412) 624-6697

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Richard C. Omanson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented at the American Educational Research Association, New York, March, 1982.

CS006547

Every morning in many primary grade classrooms, the following scenario takes place. A teacher calls together a small group of children, has them sit in a "circle," and begins the daily reading lesson. Following the suggested format in the teacher's manual that accompanies the reading series in use, the teacher prepares the children for that day's reading selection. First the children are introduced to vocabulary and concepts that the teacher's manual had identified as important to the story and potentially problematic for the children. Following this story preparation is a second type of preparation in which the children discuss the pictures and are alerted to upcoming story events that occur in the first one-to-two page segment, which is called a silent reading unit (SRU). Following this first SRU-Preparation, the children silently read the SRU. When the children have finished reading the SRU, the teacher asks a series of questions about it. After the first SRU has been completed in this way, the teacher prepares the children for the next SRU, and the procedure is repeated until the story is finished.

The components of the scenario just described, Story Preparation, SRU-Preparation, Pictures and SRU-Questions, make up what is known in the reading field as a directed reading lesson. The directed reading lesson is the traditional way to teach reading that is at least as old as the McGuffy readers of the 1820's and is still the major way that reading is taught in this country.

What does the directed reading lesson, as used in today's basal readers, do to help comprehension? Is it effective in directing how children read and understand a story? If not, can directed reading lessons be designed that are effective in guiding reading and understanding? To address these questions, various models of how children read and comprehend a story presented in a directed reading lesson were constructed and evaluated. As background, the research leading up to the work reported here will be summarized.

Phase 1: Identifying the Problems

Our research on directed reading lessons began with an analysis of the lessons contained in two of the most widely used basal reading programs in this country (Beck, McKeown, McCaslin, & Burkes, 1979). Beck et al. identified various problematic aspects of commercial reading lessons. Many of the problems stemmed from the fact that the lessons often attempted to do too much. Not only did the lessons attempt to help the children through the story, but many lessons also introduced topics such as library skills and art appreciation in the course of reading. Beck et al. argued that if lesson components are directed at these non-comprehension goals, children may be pulled away from the story rather than being helped through it.

A second source of problems found in commercial reading lessons was that the concepts introduced in the pre-story preparation lesson component often did not provide the background knowledge that was needed to comprehend the story. A number of researchers have noted the importance of background knowledge to both comprehension in general (e.g., Anderson, Reynolds & Schallert, 1977; Chiesi, Spilich & Voss, 1979) and to reading lessons in particular (e.g., Graves &

Cook, Note 1; Langer & Nicholich, Note 2; Pearson, Hansen & Gordon, 1979). When necessary background knowledge is not provided by the lesson, comprehension problems can be expected.

A third source of problems was that the commercial lessons were haphazard as far as which parts of the story they focused upon. As a result the main events of the story were not necessarily made salient. Beck et al. argued that the first-order goal of a directed reading lesson should be to ensure that children have a good grasp of the story's main events and how they are interrelated to form the plot. This first-order goal was described as that of establishing a "story map". The establishment of a story map may not be all that a teacher wants to promote during a lesson. However, Beck et al. argued that it should be the primary goal of a reading lesson, because all additional comprehension and interpretation work must build upon a basic understanding of the story.

Phase 2: Eliminating the Problems

The analysis of Beck et al. (1979) identified potential problems of commercial reading lessons. It remained to be seen, however, if this insight could be used to design lessons that were more effective in enhancing comprehension. Thus the second phase of our research began with the selection of two commercial reading lessons that contained prototypical problems. These lessons were then revised to enhance the comprehension of the story by introducing important background knowledge and helping the children form a story map. A comparison between the comprehension resulting from the commercial and revised lessons was then made.

To compare the commercial and revised lessons, Beck, Omanson & McKeown (in press) individually administered the two commercial lessons to one group of 24 third graders, and the two revised lessons to a second group of 24 third graders. After each child finished each lesson, he or she recalled the story from memory, and answered 35 forced choice questions about explicit and implicit story content. The revised lessons resulted in greater comprehension as indexed by performance on the recall task and questions.

Phase 3: Modeling the Effects

The Beck et al. (in press) study demonstrated that the revised lessons increased the amount of knowledge that the children had about the story after reading. However, the effects of the revised and commercial lessons on how children processed the story during reading remained to be described. Did the commercial and revised lessons influence processing to an equal extent? Which aspects of the lessons exerted the most influence?

To answer the above questions, we examined in detail one of the commercial lessons and its revised counterpart tested in the Beck et al (in press) study by evaluating the fit of various models to how the story is processed. The processing models assumed that either all, none, or part of each lesson was utilized during reading. By comparing the fit of these different models, some conclusions about which lesson, and which aspects of each lesson, exerted the most influence on processing can be made.

METHOD

Subjects and Design

The data for this study were obtained from the previously described Beck et al. (in press) study. The recall protocols from two groups of children were used. One group, called CL, consisted of the twenty-four third grade children who read the story as part of an original commercial lesson. The second group, called RL, were the twenty-four third grade children who read the same story as part of the revised counterpart of the commercial lesson. The two groups of children were matched on their performance on the Level I reading subtest of the Wide Range Achievement Test (Jastak & Jastak, 1965).

Materials

The commercial and revised lessons were built around a story entitled "The Raccoon and Mrs. McGinnis". This story is 811 words long and can be described as consisting of a setting, seven episodes, and a coda. A summary of the episodes is presented in Table 1. The story was analyzed in terms of the number of propositions it contained (262) and in terms of the number of processing cycles into which each proposition entered according to Kintsch and van Dijk's (1978) model and according to our extensions of this model described below.

Insert Table 1 about here

Processing Model

The models we constructed were based upon Kintsch and van Dijk's (1978) model of text processing, specifically the part of the model that concerns the construction of a micro-structure. The micro-structure of a story consists of a cohesive set of units of meaning called propositions. Kintsch and van Dijk's model assumes that a reader breaks down each sentence of a text into typically four or five propositions. These propositions are then processed in terms of units called cycles. Each cycle involves processing the propositions contained in a single sentence. During the first cycle, the propositions contained in the first sentence are encoded. To represent this encoding, Kintsch and van Dijk construct what they call a coherence graph. A coherence graph is a branching structure that hierarchically connects the propositions to a lead proposition on the basis of the overlap among the word concepts (arguments) contained in each proposition. Since readers are limited in the amount of information they can hold in "working" memory at any given time, only a small number of the most recent and superordinate propositions are "carried over" or held in memory to be part of the next processing cycle. The new propositions entering the next cycle are then connected to one of the propositions that was carried over. If a new proposition contains the same argument as a previous proposition that was not carried over, that previous proposition is "reinstated" into the current cycle, allowing a cohesive relation to be established between the two propositions. Thus, through carry-overs and reinstatements, the specific cohesive relations that mold the individual propositions into the micro-structure are made.

On the basis of these processing assumptions, Kintsch and van Dijk's model predicts that the probability of a proposition being recalled exponentially increases as the number of cycles it is in increases. The specific relationship is described as $1-(1-p)^n$, where P equals the probability of recall of a proposition that has appeared in a single cycle, and n equals the number of cycles in which the proposition has appeared.

Extending the Processing Model

Our assumption in extending Kintsch and van Dijk's model was that a story in the context of a lesson is not simply a printed text. Rather it is surrounded by additional verbal and pictorial information that is likely to influence how the text is processed. It is unlikely, however, that all of the surrounding information directly influences how the text is processed. We assumed that only the material that in some way was related to the story would influence processing. Thus, we identified and tallied the places in the surrounding lesson material that made contact with the story. In the course of doing this, we discovered that identifying the contact points was not a simple yes-no procedure. Some of the surrounding lesson material made strong or direct contact with the story. For example, describing or depicting a story event such as a picture showing a story event (e.g., the bandits walking through the woods) a question asking about a story event (e.g., "Why did the men go to Mrs. McGinnis' house?") or introducing a general concept for which the story provides an example (e.g., habit) makes direct contact with the story. Other surrounding material made only very weak or indirect contact. For example, referring to all the actions of a character

(e.g., encouraging the children to read to find out what the raccoon does) or asking them about their personal experience with a character without making contact with the text (e.g., asking if the children have ever seen a raccoon before) makes indirect contact with the story. Thus two categories of contact points, direct and indirect, were distinguished.

Having identified the direct and indirect contact points between the text and the surrounding lesson material, we next incorporated the contact points into Kintsch and van Dijk's processing model. We assumed that each contact point functioned in a way similar to text reinstatements. Contact made during the story preparation, SRU preparation, and pictures involve retrieving from memory that component's reference to the text when the story event is read. Contact made during the SRU question component involves retrieving from memory the text propositions that were queried by the question. Thus as with text reinstatements, each contact point between the lesson and story involves retrieving from memory a text proposition.

In order to incorporate these assumptions into the Kintsch and van Dijk model, we added to the value of the cycle variable (n), the number of times the lesson made contact with it. For example, if a proposition had appeared in three processing cycles, was depicted in the pictures, and asked about in the SRU questions, its cycle variable (n) would be 5, and the resulting equation would be $1-(1-p)^{5}$. Since we assumed that the contact points between the lesson and text functioned like text reinstatements, we refer to contact points as "lesson reinstatements". As will be described below, we examined models incorporating direct, indirect, and both direct and indirect

lesson reinstatements.

Results

Amount and Pattern of Recall

The children's recalls were scored as to whether they contained the gist of each proposition. There was a non-reliable trend for children in the RL group to recall more propositions, $M = 34.5$, than children in the CL group, $M = 27.8$, $t(46) = 1.33$, $p > .15$. Nonetheless, there were striking differences between the RL and CL groups in the overall pattern of propositional recall. A method employed by Spilich, Vesonder, Chiesi, & Voss (1979) was used to describe these differences. First, the proportion of children recalling each proposition was determined. From these data, recall protocols were generated which consisted of the propositions recalled by at least 50% of the subjects in each of the two groups. These data are presented in Table 2.

Insert Table 2 about here

The 50% recall text of both groups indicated that the story involved a lady, bandits, a raccoon, a cow, pigs, and a barn. However, the only events in the 50% recall text of the CL group were that the bandits stole the animals, that they threw down their moneybag, and that Mrs. McGinnis found the moneybag. Thus the events in the 50% recall text of the CL group came from only three of the seven episodes and did not include any events involving the raccoon.

In contrast, the events in the 50% recall text for the RL group indicated that Mrs. McGinnis made a wish, that the raccoon took and ate the bread, that he saw the bandits and later took to the doorstep the moneybag they threw down, and that Mrs. McGinnis found the moneybag the next morning. The 50% recall text of the RL group thus provided a much better account of the story than did the 50% recall text of the CL group. It contained events from six of the the seven episodes, included the major events of all the characters including the raccoon, and better captured the coincidental flavor of the story.

Effects on Processing

Revised Versus Commercial Lesson

The differences in recall described above suggest that the revised lesson resulted in better comprehension than the commercial lesson. The recall results, however, did not reveal how the two lessons affected processing. To assess the effect of the two lessons on processing, two types of models were fitted to each group's recall data. The first type of model, called Lesson-Reinstatement, was an extended Kintsch and van Dijk model that incorporated both the direct and indirect lesson reinstatements from the appropriate lesson. This model assumed that both the propositional structure of the text and the surrounding lesson material influences processing. The second type of model, called No-Lesson employed the Kintsch and van Dijk model without including reference to any lesson reinstatements. This model assumed that only the propositional structure of the text, and not the surrounding lesson material, influenced processing. The greater the difference between the Lesson-Reinstatement and No-Lesson

models, the greater the influence of the lesson on processing.

Validity of Lesson-Reinstatement Models. Before the Lesson-Reinstatement and No-Lesson Models were compared, we first determined if the two Lesson-Reinstatement models reflected how the revised and commercial lessons influenced processing. This determination was made by fitting both Lesson-Reinstatement models to both the RL and CL groups. If the Lesson-Reinstatement models reflect how the lessons influence processing, each model should fit the recall of the subjects that received that lesson better than the recall of subjects who received the different lesson. Equations for each proposition were generated from the Commercial and Revised Lesson-Reinstatement models. An estimate of the P parameter value was estimated for each model by the STEPIT procedure (Chandler, 1965) using the proportion of subjects recalling each proposition for estimating purposes. From the estimated P value, an index of fit in terms of recall variance accounted for was calculated. These results are presented in Table 3.

Insert Table 3 about here

As shown in Table 3, more of the CL group's variance is accounted for with the Commercial Lesson-Reinstatement model (.390) than with the Revised Lesson-Reinstatement model (.361). Similarly, more of the RL group's recall variance is accounted for with the Revised Lesson Reinstatement model (.415) than with the Commercial Lesson-Reinstatement model (.307). These results suggest that both the Revised and Commercial Lesson-Reinstatement models provide a

reasonable index of that lesson's influence on processing.

In order to assess the reliability of the above differences, the recall scores predicted by the two models (Revised and Commercial Lesson-Reinstatements) were correlated with each subject's recall. For each subject, each proposition was assigned a 1 or 0 indicating whether or not that proposition had been recalled. Using a biserial correlation, this set of 1 and 0 scores was then correlated with the predicted recall of each proposition. In this way an estimate of how well the two models fit each individual subject could be determined. These results are summarized in Table 3. An r to z transformation was performed on the correlation scores to approximate a normal distribution (see McNemar, 1949, p. 124). An analysis of variance with lesson (revised and commercial) as a between subject factor and model appropriateness as a within subject factor was performed on the z-transformed correlation scores. The results indicated that for both lesson groups, the appropriate model provided a better fit than did the inappropriate model, $F(1,41) = 13.66$, $p < .01$. No other effects or interactions were reliable.

Relative Effect of Revised and Commercial Lesson. Having established that the two Lesson-Reinstatement models provide an acceptable index of the lesson's influence, the magnitude of their influence was computed by means of influence scores. These scores consist of the difference in the fits of each Lesson-Reinstatement and the No-Lesson models. The influence score for the Revised lesson consists of the difference in the fit of the Revised-Lesson-Reinstatement and No-Lesson models. The influence score for the commercial lesson consists of the difference in the fit

of the Commercial-Lesson-Reinstatement and No-Lesson models. As before, the fit of the models was evaluated in terms of the recall variance they accounted for, using the STEPIT procedure to estimate the P parameter. Thus the influence scores reflect the increase in predictive power that lesson reinstatements provide over and above that provided by the text alone. These results are presented in Table 3.

The influence score of the Revised lesson derived from these results is .189. In contrast, the influence score of the commercial lesson is .083. The fact that the influence score was greater for the Revised than for the commercial lesson suggests that the revised lesson exerted a greater influence on processing than did the commercial lesson. The greater influence of the revised lesson on processing may thus be one reason why Beck et al. (in press) found that the revised lessons resulted in better comprehension than did the commercial lesson.

To assess the statistical reliability of these differences, biserial correlations between the actual and model predicted recall scores were computed for each subject, as described above. These data are summarized in Table 3. An analysis of variance with the lesson group (revised and commercial) as a between subject factor and presence of Lesson-Reinstatements as a within subject factor was performed on the z-transformed correlation scores. The results of this analysis indicated that the Lesson-Reinstatement models fit better than the No-Lesson-Reinstatement models, $F(1,41) = 65.33$, $p < .01$, and that this effect interacted with lesson group, $F(1,41) = 5.92$, $p < .02$. A Newman-Keuls test indicated that the

influence score of the Revised lesson was greater than that of the commercial lesson, $p < .01$.

Reasons for Greater Influence. Having found that the revised lesson influenced processing more than did the commercial lesson, the next question that needs to be asked is why it did so. One explanation that can be immediately ruled out is the number of text propositions reinstated by the two lessons. The commercial lesson reinstated more text propositions (111) than did the revised lesson (102).

If the revised lesson didn't reinstate more of the text, why was it more influential? One reason may be that the propositions reinstated by the revised lesson were, on the average, reinstated 2.8 times. In contrast, propositions reinstated by the commercial lesson were, on the average, reinstated only 1.3 times. Thus, even though the revised lesson reinstated fewer text propositions, it resulted in more total lesson reinstatements (283 versus 148). One possible effect of reinstating the text more often is that children in the RL group were better able to establish and link together the events comprising the plot of the story.

It is also important to note that doubling the number of lesson reinstatements did not double the revised lesson's length. The revised lesson was carefully engineered so that it was the same length as the commercial lesson. The reason the commercial lesson resulted in fewer lesson reinstatements was that it attempted to do more than simply highlight the text by introducing such additional topics as library skills and art appreciation. It appears that it is better to do one thing well than to do several things superficially.

Direct Versus Indirect Lesson Reinstatements

Having found that the revised lesson exerted more influence on processing, we now consider which aspects of the revised lesson were responsible for this influence. The first question to address is whether direct and indirect lesson reinstatements of the revised lesson influence processing to an equal extent.

To assess the influence of each type of lesson reinstatement, two influence scores were computed. These influence scores consist of the difference in the fit of a model that incorporates all the lesson reinstatements and the fit of a model in which one type of lesson reinstatement has been omitted. The influence score for direct lesson reinstatements consists of the difference in the fit of a model incorporating all of lesson reinstatements (called All-Reinstatement) and a model in which the direct reinstatements have been omitted (called No-Direct). The influence score for indirect lesson reinstatements consists of the difference in the fits of the All-Reinstatement model and a model in which the indirect reinstatements have been omitted (called No-Indirect).

The fit, in terms of recall variance accounted for, of the No-Direct, No-Indirect, and All-Reinstatements models was determined by the STEPIT procedure described above to estimate the P parameter of a model. These results are presented in Table 4. The influence score of direct reinstatements derived from these results is .156. In contrast the influence score of indirect reinstatements is -.001. These influence scores suggest that direct lesson reinstatements have an influence on processing over and above that exerted by indirect lesson reinstatements, while indirect lesson reinstatements apparently

have little influence on processing over and above that of direct lesson reinstatements. This is an important, though hardly a surprising, finding. It suggests that for the purposes of directing processing, little is gained by including global references to the story or asking about childrens' experience without making contact with the story. There is no substitute for identifying the important parts of a story, and repeatedly reinstating them throughout the lesson.

Insert Table 4 about here

To assess the statistical reliability of these influence scores point-biserial correlations between the model-predicted and actual recall scores were computed for each subject. An analysis of variance with model type (No-Direct, No-Indirect, and All-Reinstatements) as a within subject factor was performed on the z-transformed scores. The results indicated that there was a reliable difference among the models, $F(2,42) = 34.61$, $p < .01$. The difference between the recall variance accounted for by the No-Direct and All-Reinstatement models comprising the influence score for direct lesson reinstatements was reliable, $p < .05$, Newman-Keuls test. The difference between the recall variance accounted for by the No-Indirect and All-Reinstatements models comprising the influence score for indirect lesson reinstatements was not reliable, $p > .05$, Newman-Keuls test.

Effects of Individual Lesson Components

Having localized the influential aspect of the revised lesson to that of direct reinstatements, we can further pinpoint the source of the influence of these direct lesson reinstatements by considering the relative influence they exert within each of the four lesson components, Story Preparation, SRU Preparation, Pictures, and SRU Questions. As before, the fit of the All-Direct, No-Picture, No-SRU, No-Story, and No-Question models was computed in terms of recall variance accounted for obtained by using the STEPIT procedure to estimate the P parameter for each model's equations. These results are presented in Table 5.

Insert Table 5 about here

As is shown in Table 6, the influence scores for each component derived from these values are for Picture, .016, SRU-Preparation, .033, Story-Preparation, .049, and SRU-Questions, .064. These influence scores suggest that the SRU-Questions and Story-Preparation components exerted the most influence on processing while the picture component exerted the least influence.

Insert Table 6 about here

To assess the statistical reliability of these differences, biserial correlations between the model-predicted and actual recall scores were computed for each subject. These results are also presented in Table 5. An analysis of variance with model type (All-Direct, No-Pictures, No-Story, No-SRU, and No-Questions) as a within subject factor was performed on the z-transformed correlation scores. The results indicated that there was a reliable difference among the models, $F(4,84) = 8.56$, $p < .01$. Newman-Keuls tests showed that the influence scores of the SRU-Preparation, Story-Preparation, and SRU-Question components were reliably greater than zero, $p <$, .05, .01, and .01, respectively. The influence score of the Picture component was not reliably greater than 0, $P > .05$. Moreover, the influence scores of the Story-Preparation and SRU-Question components were both reliably greater than that of the picture component, $P < .05$ and .01 respectively, Newman-Keuls test. Thus, of the four lesson components, the Story-Preparation and SRU-Question components exerted the most influence.

It is interesting to note that the size of a lesson component's influence score was not a direct reflection of either the number of propositions it reinstated or the number of times reinstated propositions were reinstated. As is shown in Table 6, the SRU Preparation component reinstated fewer propositions than did the Picture component (26 versus 37), yet the influence score of the SRU Preparation component (.033) was larger than the influence score of the Picture component (.016). Similarly, the SRU-Question lesson component produced fewer reinstatements per reinstated proposition than did the Story Preparation component (1.2 versus 2.2), yet the SRU

Question component had a larger influence score (.064) than did the Story Preparation component (.049). This suggests that the relative influence of lesson components is somewhat independent of how much or how often they reinstate text propositions.

DISCUSSION

The importance of the work reported in this paper lies in the fact that plausible descriptions of children's processing during two different reading lessons have been provided. Through the use of modeling, we have been able to construct an account of how children process a story and how they utilize lesson components during directed reading lessons. An account of what children do during a lesson may give us more insight into how to design reading lessons than a simple account of what children do after the lesson.

One insight we have gleaned from the present processing description is that if a directed reading lesson focuses solely on introducing relevant background knowledge and prompting children to construct a story map it will exert a greater influence on how the children process the story. One likely reason why our revised lesson was more effective in directing how children processed the story is that the central parts of the story were reinstated repeatedly by different lesson components. The revised lesson was able to do this because its only immediate goals were either to reinstate, or to introduce background knowledge important to, central story content. The commercial lesson was not so single minded, and attempted to not only help children understand the story, but to expose them to more general skills such as art appreciation and library skills. The result was not a richer instruction, but rather, instruction with less

focus and less effectiveness in directing how the children read.

Another insight we obtained concerned identifying which aspects of the revised lesson were the most influential. First we found that asking about, describing, or introducing general concepts that categorize text events directly influenced processing more than references that were very general or involved the child's personal experiences without tying them to the story.

Second, we found that the SRU-Question and Story Preparation were the most influential lesson components. In general these two lesson components related the most directly to our lesson revision goals. The Story-Preparation component naturally lent itself to introducing relevant background knowledge and the SRU-Question naturally lent themselves to prompting children to construct a story map (cf., Beck & McKeown, 1981). It may be for this reason that the influence of the revised lesson reside primarily in these two components.

The processing description provided in this paper is far from complete. Many important aspects of comprehension such as making causal connections, constructing a macro-structure, coping with ambiguities, distant referents, missing causes, and other structural complexities, have all been ignored. However, we are encouraged by how much we have learned from the simple models we used. Indeed, the insights gained from the extended Kintsch and van Dijk models used here suggest that constructing more elaborate models that can provide richer descriptions of processing is a promising direction for future research.

Acknowledgements

The research reported in this paper was supported by the Learning Research and Development Center, funded in part as a research and development center by the National Institute of Education (NIE), United States Department of Health, Education, and Welfare. The opinions expressed do not necessarily reflect the position or policy of NIE, and no official endorsement should be inferred. The authors wish to thank Martha Pople for her assistance with the data analysis. The authors also wish to express a special thanks to Timothy Post for his theoretical and technical assistance in statistically evaluating the models described in this paper.

Footnotes

1. The formula used to calculate the recall variance accounted for was:

$$1 - \frac{\Sigma(x - p)^2}{\Sigma(x - \bar{x})^2}$$

where x = the proportion of subjects recalling that proposition

$\bar{x}$ = the mean proportion of subjects recalling a proposition

p = the predicted proportion of subjects recalling a proposition

2. Five subjects, three from the commercial and two from the revised subject groups, were omitted from all the analyses involving biserial correlations. These subjects recalled less than 16 propositions. This low recall resulted in an extreme inbalance in the proportion of recalled and non-recalled propositions (6% versus 94%). When such extreme imbalances occur, the biserial correlation is inaccurate (McNemar, 1949, p. 172).

Reference Notes

1. Graves, M. F., & Cooke, C. L. Effects of previewing difficult short stories on low ability junior high school student's comprehension, recall, and attitudes. Manuscript submitted for publication, 1981.

2. Langer, J. A., & Nicholich, M. Effect of altered prior knowledge on passage recall. Paper presented at the National Reading conference, November, 1980. (ERIC Document Reproduction Service No. E9 197 282)

References

Anderson, R. C., Reynolds, R. E., & Schallert, E. T. Frameworks for comprehending discourse. American Educational Research Journal, 1977, 14, 367-381.

Beck, I. L., & McKeown, M. G. Developing questions that promote comprehension: The story map. Language Arts, 1981, 58, 913-918.

Beck, I. L., McKeown, M. G., McCaslin, E. S., & Burkes, A. M. Instructional dimensions that may affect reading comprehension: Examples from two commerical reading programs. (LRDC Publication 1979/20). Pittsburgh: University of Pittsburgh, Learning Research and Development Center, 1979.

Beck, I. L., Omanson, R. C., & McKeown, M. G. An instructional redesign of reading lessons: Effects on comprehension. Reading Research Quarterly, in press.

Chandler, J. P. STEPIT Program 90PE66, quantum chemistry program exchange. Indiana University, Bloomington, Indiana, 1965.

Chiesi, H. L., Spilich, G. J., & Voss, J. F. Acquisition of domain-related information in relation to high and low domain knowledge. Journal of Verbal Learning and Verbal Behavior, 1979, 18, 257-273.

Clymer, T. (Senior author) Reading 720. Lexington: Ginn, 1976.

Kintsch, W., & Van Dijk, T. A. Toward a model of text comprehension and production. Psychological Review, 1978, 85, 363-394.

McNemar, Q. Psychological Statistics. New York: John Wiley, 1949.

Pearson, P. D., Hansen, J., & Gordon, C. The effect of background knowledge on young children's comprehension of explicit and implicit information. Journal of Reading Behavior, 1979, 11, 201-209.

Spilich, G. J., Vesonder, G. T., Chiesi, H. L., & Voss, J. F. Text processing of domain-related information for individuals with high and low domain knowledge. Journal of Verbal Learning and Verbal Behavior, 1979, 18, 275-290.

Table 1

Structural Components in "The Raccoon and Mrs. McGinnis"

Structural Component	Description
Setting	A raccoon lives in a tree next to Mrs. McGinnis. Mrs. McGinnis has a cow and two pigs. She regularly leaves bread on her doorstep for the raccoon.
Episode 1	Mrs. McGinnis wishes on a star for a barn for her cow and pigs, and then goes to bed.
Episode 2	raccoon comes down from his tree, eats the bread left by Mrs. McGinnis, and looks for more food.
Episode 3	masked bandits come and steal Mrs. McGinnis' cow and pigs.
Episode 4	raccoon follows the bandits and eventually climbs a tree.
Episode 5 (Occurs during episode 4)	bandits think someone is following them, so when they see the mask of the little raccoon in the tree, they flee, leaving behind a bag of money they have stolen.
Episode 6	raccoon picks up the bag of money, goes back to Mrs. McGinnis's house to look for more food, and leaves the bag of money behind when he returns to his tree.
Episode 7	McGinnis finds the bag of money the next morning, and thinking her wish on a star has come true, uses the money to build a barn.
Coda	Restatement that Mrs. McGinnis thought the money .ame from her wish and that she continued her habit of feeding the raccoon.

Table 2

50% Recall Texts of Revised and Commercial Groups

Commercial	Revised
There was a lady, a raccoon, some bandits, a cow, some pigs and a barn in the story. The bandits stole the cow and pigs. Then they threw down their moneybag. Mrs. McGinnis found the moneybag on her steps.	There was a lady, a raccoon, some bandits, a cow, some pigs, and a barn in the story. Mrs. McGinnis wished for a barn. The raccoon came down from his tree, picked up some bread, swished it in the water, and ate it. Then he heard two men coming along. The men stole the cow and pigs. Then they threw down their money bag and ran away. The raccoon dropped the moneybag on Mrs. McGinnis' doorstep. The next day, Mrs. McGinnis found the moneybag.

Table 3

Relative Fit of Models Incorporating Revised, Commercial, and No Lesson Reinstatements

Group	Index of Fit	Model: Revised Lesson Reinstatement	Model: Commercial Lesson Reinstatement	Model: No Lesson
Revised Lesson	VAF[1]	.415	.314	.226
	r^2[2]	.647	.576	.506
	P[3]	.050	.054	.063
Commercial Lesson	VAF[1]	.361	.390	.307
	r^2[2]	.637	.670	.602
	P[3]	.036	.045	.053

1 Recall variance accounted for, calculated as $1 - \frac{\Sigma(x - p)^2}{\Sigma(x - \bar{x})^2}$ where x = actual recall, $\bar{x}$ = mean recall, and p = predicted recall.

2 Mean biserial correlation between predicted and actual recall.

3 Value of P parameter.

Table 4

Relative Fit of No-Direct, No-Indirect, and All-Reinstatement Models

Index of Fit	Model		
	No-Direct	No-Indirect	All-Reinstatement
VAF[1]	.259	.416	.415
r^2[2]	.510	.627	.642
P[3]	.060	.050	.050

1 Recall variance accounted for, calculated as $1 - \frac{\Sigma (x - p)^2}{\Sigma (x - \bar{x})^2}$ where x = actual recall, $\bar{x}$ = mean recall, and p = predicted recall.

2 Mean biserial correlation between predicted and actual recall.

3 Value of P parameter.

Table 5

Relative Fit of All-Direct, No-Picture, No-SRU, No-Story, No-Question Models

Index of Fit	Model[4] AR	NP	NSRU	NS	NQ
VAF[1]	.416	.400	.383	.367	.352
r^2[2]	.647	.632	.621	.608	.601
P[3]	.050	.051	.050	.057	.053

1
Recall variance accounted for, calculated as $1 - \frac{\Sigma (x - p)^2}{\Sigma (x - \bar{x})^2}$
where x = actual recall, $\bar{x}$ = mean recall, and p = predicted recall.

2
Mean biserial correlation between predicted and actual recall.

3
Value of P parameter.

4
AR = All Direct Model
NP = No-Picture Model
NSRU = No-SRU Model
NS = No-Story Model
NQ = No-Question Model

Table 6

Influence Scores and Reinstatements
of Each Lesson Component

	Model			
Measure	Picture	SRU Preparation	Story Preparation	SRU Question
Influence Score	.016	.033	.049	.064
Number of Propositions Reinstated	37	23	50	68
Number of Reinstatements per Reinstated Proposition	1.0	1.1	2.2	1.2